Geophysical Research Abstracts
Vol. 20, EGU2018-8300, 2018
EGU General Assembly 2018

The human fingerprint on drought and water scarcity risk: challenges and prospects

Ted Veldkamp (1,2)

(1) VU University Amsterdam, Institute for Environmental Studies, Amsterdam, Netherlands (ted.veldkamp@vu.nl), (2) International Institute for Applied Systems Analysis, Laxenburg, Austria

The availability of freshwater resources is critical to daily life. Despite the fact that only 10% of freshwater resources available globally are utilized, many regions are currently experiencing water scarcity. The impacts of water scarcity are numerous and include crop failures, food shortages and famines, economic losses as a result of the disruption of business activities, and the degradation of terrestrial and aquatic ecosystems. Hence, an urgent need exists to develop effective adaptation strategies.

The correct identification and characterisation of drought and water scarcity conditions is crucial for successful adaptation management. Drought and water scarcity indicators enable the operationalisation of drought and water scarcity concepts by the assimilation of large amounts of meteorological, hydrological, and socio-economic information into quantitative values, which could be applied in forecasting, detection, and declaration of drought and water scarcity events, as well as in contingency planning, and impact assessment.

Increasing computational power has enabled the development of global hydrological and land surface models (GHMs) over the past decades, allowing high-resolution modelling of water resources and hydrological extremes in global, regional, and local settings, and covering thereby also those regions with sparse observations. As human impacts on the hydrological cycle play a pivotal role in present-day water related hazards, a fair amount of research has been carried out recently to correctly represent these interactions in (global hydrological) models. These model developments include the incorporation of dam and reservoir operations, the representation of human water use, and return flows; and representations of land use, land management, and land cover change

These advances are opening-up the applicability and potential use of GHMs in global, regional, and local settings, ranging from water resources, natural hazard and risk related research to contributions that feed into global policy making and disaster risk reduction activities. Being able to providing sufficient insight in the capacity of such models, including the human dimension, to resemble real-world hydrological conditions is key in these developments.

Touching upon multiple research outputs with results at global to local scales, this contribution shows: (a) how human impact parameterization influences the ability of global hydrological models to correctly represent freshwater resources and to identify drought and water scarcity conditions; (b) how human activities may affect drought vulnerability and the spatiotemporal dependency structures of drought and water scarcity risk; and (c) why we need to account for bounded-rational human behaviour and human-water interactions in optimizing adaptation design to cope with current and future drought and water scarcity impacts. On the basis of our results we formulate a number of research challenges and prospects for the hydrology community advancing towards global integrated hydrology simulations.